IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Fan-Nan Lin

Prior Application: 09/343,947
Examiner: C. Nguyen
Group Art Unit: 1754

For: CATALYTIC REFORMING CATALYST ACTIVATION

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Pursuant to 37 C.F.R. 1.53(b), Applicant submits the following amendments.

In the Claims

Please cancel claims 1 - 16 and 18 - 20 without prejudice.

Clean Copy of Claims - In compliance with new 37 C.F.R.§1.121(c), please find beginning on the next page clean, amended claim 17. Please substitute and enter this claim for the pending claim 17.

17. (amended) In a process for reforming naphthene and paraffin-containing petroleum hydrocarbons of gasoline or naphtha boiling range in the presence of molecular hydrogen wherein there is employed a multiple reaction zone system to provide reformates, the improvement which comprises utilizing in said multiple reaction zone system a chlorine-treated catalyst activated by:

(a) reducing a platinum-containing reforming catalyst with hydrogen; and

(b) simultaneously with step (a) contacting said platinum-containing reforming catalyst with a chlorine-containing compound by introducing said chlorine-containing compound into a reaction zone of said multiple reaction zone system under conditions to effect decomposition of said chlorine-containing compound thereby providing said chlorine-treated catalyst having from about 1.05 to about 1.3 weight percent chlorine.

Please add the following new claims:

21. (new) A process according to claim 17 wherein said chlorine-containing compound is selected from the group consisting of tetrachloroethylene, hexachloroethane, carbon tetrachloride, 1-chlorobutane, 1-chloro-2-methyl propane, 2-chloro-2-methyl propane, tertiary butyl chloride, propylene dichloride, perchloroethylene, and mixtures of two or more thereof.

22. (new) A process according to claim 21 wherein said chlorine-containing compound is perchloroethylene.

23. (new) In a process for reforming naphthene and paraffin-containing petroleum hydrocarbons of gasoline or naphtha boiling range in the presence of molecular hydrogen wherein there is employed a multiple reaction zone system to provide reformates, the improvement which comprises utilizing in said multiple reaction zone system a chlorine-treated catalyst regenerated and activated by:

(a) purging said multiple reaction zone system with an inert gas;

(b) subjecting a deactivated reforming catalyst, contained within said multiple reaction zone system, to an oxidative burning off at a temperature and for a period of time sufficient to remove substantially all carbonaceous deposits thereon thereby providing a substantially carbon free catalyst;

(c) subjecting said substantially carbon free catalyst to an oxygen treatment with a gas containing molecular oxygen at a temperature and for a time sufficient to effect the oxidation of the metals contained in said substantially carbon free catalyst thereby providing an oxidized catalyst;

(d) purging said oxidized catalyst of molecular oxygen thereby providing a purged catalyst;

(e) cooling said purged catalyst thereby providing a cooled catalyst;

(f) reducing said cooled catalyst with hydrogen, said hydrogen being introduced into a reaction zone of said multiple reaction zone system; and

(g) simultaneously with step (f) contacting said cooled catalyst with a chlorine-containing compound by introducing said chlorine-containing compound into said reaction zone of said multiple reaction zone system under conditions to effect decomposition of said chlorine-containing compound thereby providing said chlorine-treated catalyst.

24. (new) A process according to claim 23 wherein said oxidative burning off step (b) is carried out at a temperature in the range of from about 300°F to about 1,300°F and for a period of time in the range of about 4 to about 36 hours.

25. (new) A process according to claim 23 wherein said gas of said oxygen treatment step (c) contains from about 5 to about 15 percent by volume of molecular oxygen.

26. (new) A process according to claim 25 wherein said oxygen treatment step (c) is carried out at a temperature in the range of about 800°F to about 1,150°F.

27. (new) A process according to claim 23 wherein said purged catalyst is cooled to a temperature in the range of about 600°F to about 1,000°F.

28. (new) A process according to claim 23 wherein step (f) and step (g) are carried out at a temperature in the range of about 500°F to about 1,500°F and at a pressure in the range of from about 0 to about 600 psig.

29. (new) A process according to claim 23 wherein said deactivated reforming catalyst is a platinum-on-alumina reforming catalyst.

30. (new) A process according to claim 29 wherein said platinum-on-alumina reforming catalyst also contains at least one metal selected from the group consisting of rhenium, iridium, ruthenium, tin, palladium, germanium, and combinations of two or more thereof.

31. (new) A process according to claim 23 wherein said nonmetallic chlorine-containing compound is selected from the group consisting of tetrachloroethylene, hexachlorethane, carbon tetrachloride, 1-chlorobutane, 1-chloro-2-methyl propane, 2-chloro-2-methyl propane, tertiary butyl chloride, propylene dichloride, perchloroethylene, and mixtures of two or more thereof.

32. (new) A process according to claim 31 wherein said chlorine-containing compound is perchloroethylene.

In the Specification

Please add the following new paragraph as the first paragraph on page 1 of the specification:

(new)

This application is a division of application serial number 09/343,947, filed June 30, 1999, now allowed.

Clean Copy of Specification Amendments - In compliance with new 37 C.F.R.§1.121(b), please find beginning on the next page clean, amended paragraphs. Please substitute and enter the following amended paragraphs for the current corresponding paragraphs.

Page 6, Paragraph 1: (amended)

period of time sufficient to effect the oxidation of metals contained in the substantially-carbon-free catalyst; (d) purging the resulting oxidized catalyst of molecular oxygen; (e) cooling the resulting purged catalyst; (f) reducing the cooled catalyst by contacting with hydrogen which is introduced into a reaction zone of the multiple reaction zone system; (g) simultaneously with step (f) contacting the catalyst with a nonmetallic chlorine-containing compound by introducing the chlorine-containing compound into a reactor of the multiple reaction zone system; and (h) thereafter purging the resulting catalyst systems of steps (f) and (g) with hydrogen for a period of time necessary to remove excess chlorine from the catalyst prior to start up of the multiple reaction zone reforming system.

Page 9, Paragraph 1: (amended)

Generally, the quantity of chlorine-containing compound employed during the chloride treatment must be sufficient to add to the catalyst system from about 0.05 to about 0.3 weight percent chlorine by weight of the total catalyst system (ie. to add about 0.0005 to about 0.003 pounds of chlorine per pound of catalyst), preferably from about 0.1 to about 0.2 weight percent chlorine by weight of the total catalyst system (ie. to add about 0.001 to about 0.002 pounds of chlorine per pound of catalyst). The temperature employed during chloride treatment must be sufficient so as to effect decomposition of the chlorine-containing compound. The chloride treatment can be performed at a temperature of from about

500°F to about 1,500°F, preferably from about 700°F to about 1,200°F, and most preferably from about or 900°F to or about 940°F, and a pressure in the range of about 0 to about 600 psig, preferably about 50 to about 300 psig.

Page 15, Paragraph 2: (amended)

The catalyst system was activated at 940°F by introducing hydrogen at 200 psig while adding perchloroethylene at 32 microliters/hr for 15 minutes to add 0.2 weight percent chloride to the catalyst.

Page 15, Paragraph 5: (amended)

Perchloroethylene was then added to this system in an amount of 1.3 ppm to the hydrocarbon feed.

In the Abstract

Clean copy of amended Abstract - Please substitute and enter the following amended Abstract for the current Abstract.

Page 25, Paragraph 1: (amended)

Catalyst activation of a platinum reforming catalyst system contained in a multiple reactor system by simultaneously reducing the catalyst with hydrogen while introducing a nonmetallic chlorine-containing compound into a reactor of the multiple reactor system in an amount to add from about 0.05 to about 0.3 weight percent chlorine to the catalyst and thereafter purging the system with about 100 to about 50,000 cubic feet of hydrogen per cubic foot of catalyst resulting in a reforming system having increased activity and providing enhanced RON values with reduced cracking of feedstock.

Remarks

This application is submitted in response to the final restriction requirement restricting the prior parent application to multiple inventions. This application is directed to non-elected claims of invention Group III.

In the specification, a cross reference to the prior application has been added and several corrections have been made. In the abstract, the abstract has been amended. In the claims, claims 1 - 16 and 18 - 20 have been cancelled, claim 17 has been amended, and new claims 21 - 32 have been added.

Specification Amendments/Corrections

The replacement of the word "dried" with --- cooled --- on line 4 of page 6 of the specification corrects an obvious error. The "cooling the resulting

purged catalyst" in the preceding step (e) on line 3 of page 6 naturally results in a "cooled" catalyst for step (f) and not a "dried" catalyst.

The replacement of "perchloroethane" with --- perchloroethylene --- on line 4 of page 15 and on line 14 of page 15 corrects obvious errors and are supported by the list of chlorine-containing compounds on page 8, lines 12 - 19 which lists perchloroethylene and not perchloroethane.

The replacement of the word "give" with --- add --- and the replacement of the word "on" with --- to --- on line 5 of page 15 of the specification corrects an obvious error. To explain this obvious error, the examiners attention is drawn to page 14, line 17 to page 15, line 5 of the specification. Applicant points out that the R-56 Pt alumina reforming catalyst used in this example contains, among other things, "about 1.0 wt. % Cl on gamma alumina". The next paragraph, starting at line 3 of page 15, concerns activation of this catalyst system (which contains 1.0 wt. % Cl) by introducing hydrogen while adding a chlorine-containing compound. This is where the obvious error occurs when it says that activation in this manner will "give 0.2 weight percent chloride on the catalyst". It is an obvious error in wording to say that activation of a catalyst system containing 1.0 wt. % Cl with hydrogen while adding perchloroethylene will "give 0.2 weight percent chloride on the catalyst". It makes no sense that there would be less chloride on the catalyst after activation with the chlorine-containing compound than there was on

the catalyst before activation. Thus, it was clearly intended that the activation of the catalyst system would "add 0.2 wt. % chloride to the catalyst".

The amendments to lines 2 - 5 of page 9 of the specification are also made to correct obvious errors and are supported in the specification at page 14, line 14 to page 15, line 5, as amended. These amendments bring the discussion on page 9, lines 1 - 5 into its intended consistency with Example I at page 14, line 14 to page 15, line 5.

Claim Amendments

Support for the amendments to claim 17 can be found at page 9, lines 1 - 5, as corrected, in Example I at page 14, line 10 to page 15, line 5, as corrected, at page 14, lines 3 - 5, and in original claim 1. Support for new claims 21 - 22 and 24 - 32 can be found in original claims 5 - 6 and 8 - 16. Support for new claim 23 can be found in original claims 7 and 18, at page 9, line 19 to page 10, line 1; page 11, lines 4 - 5; and page 14, lines 3 - 5.

Abstract Amendments

Support for the amendments to the abstract can be found at page 9, lines 1 - 5, as corrected.

Applicants respectfully request an early notice of allowance.

Respectfully submitted

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Date Of Deposit: July 31, 2001

I hereby certify that this fee letter is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated and is addressed to the Assistant Commissioner of Patents, Washington, D.C. 20231, on

July 31, 2001
(Date)

Jeffrey R. Anderson
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VERSION WITH MARKINGS TO SHOW CHANGES IN CLAIMS

17. (amended) In a process for reforming naphthene and paraffin-containing petroleum hydrocarbons of gasoline or naphtha boiling range in the presence of molecular hydrogen wherein there is employed [in series a plurality of catalytic reaction zones] a multiple reaction zone system to provide reformates, the improvement which comprises utilizing in said [catalytic reaction zones] multiple reaction zone system a chlorine-treated catalyst activated by [the process of claim 1]:

(a) reducing a platinum-containing reforming catalyst with hydrogen; and

(b) simultaneously with step (a) contacting said platinum-containing reforming catalyst with a chlorine-containing compound by introducing said chlorine-containing compound into a reaction zone of said multiple reaction zone system under conditions to effect decomposition of said chlorine-containing compound thereby providing said chlorine-treated catalyst having from about 1.05 to about 1.3 weight percent chlorine.

VERSION WITH MARKINGS TO SHOW CHANGES IN SPECIFICATION

Page 6, Paragraph 1: (amended)

period of time sufficient to effect the oxidation of metals contained in the substantially-carbon-free catalyst; (d) purging the resulting oxidized catalyst of molecular oxygen; (e) cooling the resulting purged catalyst; (f) reducing the [dried] cooled catalyst by contacting with hydrogen which is introduced into a reaction zone of the multiple reaction zone system; (g) simultaneously with step (f) contacting the catalyst with a nonmetallic chlorine-containing compound by introducing the chlorine-containing compound into a reactor of the multiple reaction zone system; and (h) thereafter purging the resulting catalyst systems of steps (f) and (g) with hydrogen for a period of time necessary to remove excess chlorine from the catalyst prior to start up of the multiple reaction zone reforming system.

Page 9, Paragraph 1: (amended)

Generally, the quantity of chlorine-containing compound employed during the chloride treatment must be sufficient to [provide in] add to the catalyst system from about 0.05 to about 0.3 weight percent chlorine by weight of the total catalyst system (ie. to add about 0.0005 to about 0.003 pounds of chlorine per pound of catalyst), preferably from about 0.1 to about 0.2 weight percent chlorine by weight of the total catalyst system (ie. to add about 0.001 to about 0.002 pounds of chlorine per pound of catalyst). The temperature employed during chloride treatment must be sufficient so as to effect decomposition of the chlorine-containing compound. The chloride treatment can be performed at a temperature of from about 500°F to about

1,500°F, preferably from about 700°F to about 1,200°F, and most preferably from about or 900°F to or about 940°F, and a pressure in the range of about 0 to about 600 psig, preferably about 50 to about 300 psig.

Page 15, Paragraph 2: (amended)

The catalyst system was activated at 940°F by introducing hydrogen at 200 psig while adding [perchloroethane] perchloroethylene at 32 microliters/hr for 15 minutes to [give] add 0.2 weight percent chloride [on] to the catalyst.

Page 15, Paragraph 5: (amended)

[Perchloroethane] Perchloroethylene was then added to this system in an amount of 1.3 ppm to the hydrocarbon feed.

VERSION WITH MARKINGS TO SHOW CHANGES IN ABSTRACT

Page 25, Paragraph 1: (amended)

Catalyst activation of a platinum reforming catalyst system contained in a multiple reactor system by simultaneously reducing the catalyst with hydrogen while introducing a nonmetallic chlorine-containing compound into a reactor of the multiple reactor system in an amount to [provide] add from about 0.05 to about 0.3 weight percent chlorine [on] to the catalyst and thereafter purging the system with about 100 to about 50,000 cubic feet of hydrogen per cubic foot of catalyst resulting in a reforming system having increased activity and providing enhanced RON values with reduced cracking of feedstock.